Claims

We claim:

1   1. A method for detecting an unusual event in a video, comprising:

2   extracting motion vectors from each frame in a video;

3   determine zero run-length parameters for each frame from the motion

4   vectors;

5   summing the zero run-length parameters over predetermined time intervals

6   of the video;

7   determining a distance between the sum of the zero run-lengths of a current

8   time interval and the sum of the zero run-lengths of a previous time interval;

9   signalling the unusual event if the distance is greater than a predetermined

10   threshold.

1   2. The method of claim 1 wherein the zero run-length parameters are classified into

2   short, medium and long zero run-lengths.

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4   3. The method of claim 2 wherein the zero run-length parameters are normalized

5   with respect to a width of each frame of the video.

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1   4. The method of claim 2 wherein short zero run-lengths are defined to be one third

2   the width of the frame or less, medium zero run-lengths are greater than one third

3   and less than two thirds of the width of the frame, and long zero run-lengths are

4   equal to or greater than the width of the frame.

Rule 1.126

1   5. The method of claim 1 wherein the zero run-length parameters express the

2   number, size, and shape of distinct moving objects in the video.

1   6. The method of claim 2 wherein the distance is an absolute difference of the short

2   run-lengths sums.

7. The method of claim 2 wherein the distance is a difference of squares of the

short and long zero run-lengths.

1   8. The method of claim 1 wherein the video is of a scene without moving objects,

2   and the unusual event is a moving object entering the scene in the video.

1   9. The method of claim 1 wherein the video is of a scene including vehicle traffic

2   on a highway, and the unusual event is stalled traffic.

1   9. The method of claim 1 wherein the stalled traffic is due to an out-of-scene

2   accident.

1   10. The method of claim 1 wherein the unusual event is inferred but not directly

2   observed.

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1   12. The method of claim 1 further comprising:

2   detecting the unusual event in a real-time video.

1   13. A system for detecting an unusual event in a video, comprising:

2   a camera acquiring a video of a scene;

3   means for extracting motion vectors from each frame in the video;

4   means for determine zero run-length parameters for each frame from the

5 motion vectors;

6   means for summing the zero run-length parameters over predetermined time

7 intervals of the video;

8   means for determining a distance between the sum of the zero run-lengths of

9 a current time interval and the sum of the zero run-lengths of a previous time

10 interval; and

11   an alarm device for signalling the unusual event if the distance is greater

12 than a predetermined threshold.

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